

# **Spot Safety Project Evaluation**

Project Log # 200704314

Spot Safety Project # 04-01-217

## **Spot Safety Project Evaluation of the Flasher Installation At the Intersection of NC 111 (Patetown Rd) and SR 1547 (Stoney Creek Church Rd) Wayne County**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
Traffic Engineering and Safety Systems Branch  
North Carolina Department of Transportation

**Principal Investigator**

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Jason B. Schronce

Traffic Safety Project Engineer

7-16-07  
\_\_\_\_\_  
Date

# ***Spot Safety Project Evaluation Documentation***

## **Subject Location**

Evaluation of Spot Safety Project Number 04-01-217 – The Intersection of NC 111 (Patetown Rd) and SR 1547 (Stoney Creek Church Rd) in Wayne County.

## **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the installation of an overhead continuous flasher. In the study period, NC 111 and SR 1547 were both two-lane facilities at the subject intersection with no turn lanes and standard speed limits of 55 mph. NC 111 is additionally operated with a 45 mph intersection advisory speed limit. The subject location is a four-leg crossroads type intersection, which is controlled by a stop condition on the SR 1547 (Stoney Creek Church Rd) approaches. The intersection is also equipped with advance intersection warning signs on the NC 111 legs and advance stop ahead warning signs on SR 1547 respectively.

The original statement of problem was the high number of angle collisions occurring at the intersection. A concerned private citizen, who travels this section of roadway frequently, made the investigation request.

The initial crash analysis was completed from July 31, 1997 to July 31, 2000 with fourteen (14) reported crashes, nine (9) of which were Angle Crashes. These crashes resulted in 4 “A”, 3 “B”, and 8 “C” type injuries.

The final completion date for the improvement at the subject intersection was on May 14, 2002 with a total cost of \$15,000.00.

## **Naive Before and After Analysis**

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from March 1, 2002 to July 31, 2002. The before period consisted of reported crashes from September 1, 1997 through February 28, 2002 (4 years and 6 months) and the after period consisted of reported crashes from August 1, 2002 through January 31, 2007 (4 years and 6 months). The ending date for this analysis was determined by the date of available crash data at the time of the evaluation.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure.

The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

<u>Treatment Information</u>			
	<b>Before</b>	<b>After</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total crashes	18	14	- 22.22 %
Total Severity Index	17.33	9.59	- 44.66 %
Target Crashes	14	7	- 50.00 %
Target Crash Severity Index	22.00	8.37	- 61.95 %
Volume	6,500	6,600	1.54 %
<u>Injury Crash Summary</u>			
Fatal injury Crashes	0	1	100.00 %
Class A injury Crashes	3	0	- 100.00 %
Class B injury Crashes	2	0	- 100.00 %
Class C Injury Crashes	7	6	- 14.29 %
Total Injury Crashes	12	7	- 41.67 %

The naive before and after analysis at the treatment location resulted in a 22 percent decrease in Total Crashes, a 50 percent decrease in Target Crashes, and a 45 percent decrease in the Total Severity Index. The before period ADT year was 1999 and the after period ADT year was 2004.

## Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 22 percent decrease in Total Crashes and a 50 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagram*, a large portion of crashes at the intersection in the before period (11 of 18) were the result of a vehicle improperly crossing NC 111 on SR 1547. After the flasher installation, this pattern was reduced to five (5) crashes. Not only was the crash pattern reduced but also the impact speeds of the NC 111 vehicles were consistently lowered. Evidently, the flasher was successful in bringing greater attention of the intersection to traffic on NC 111.

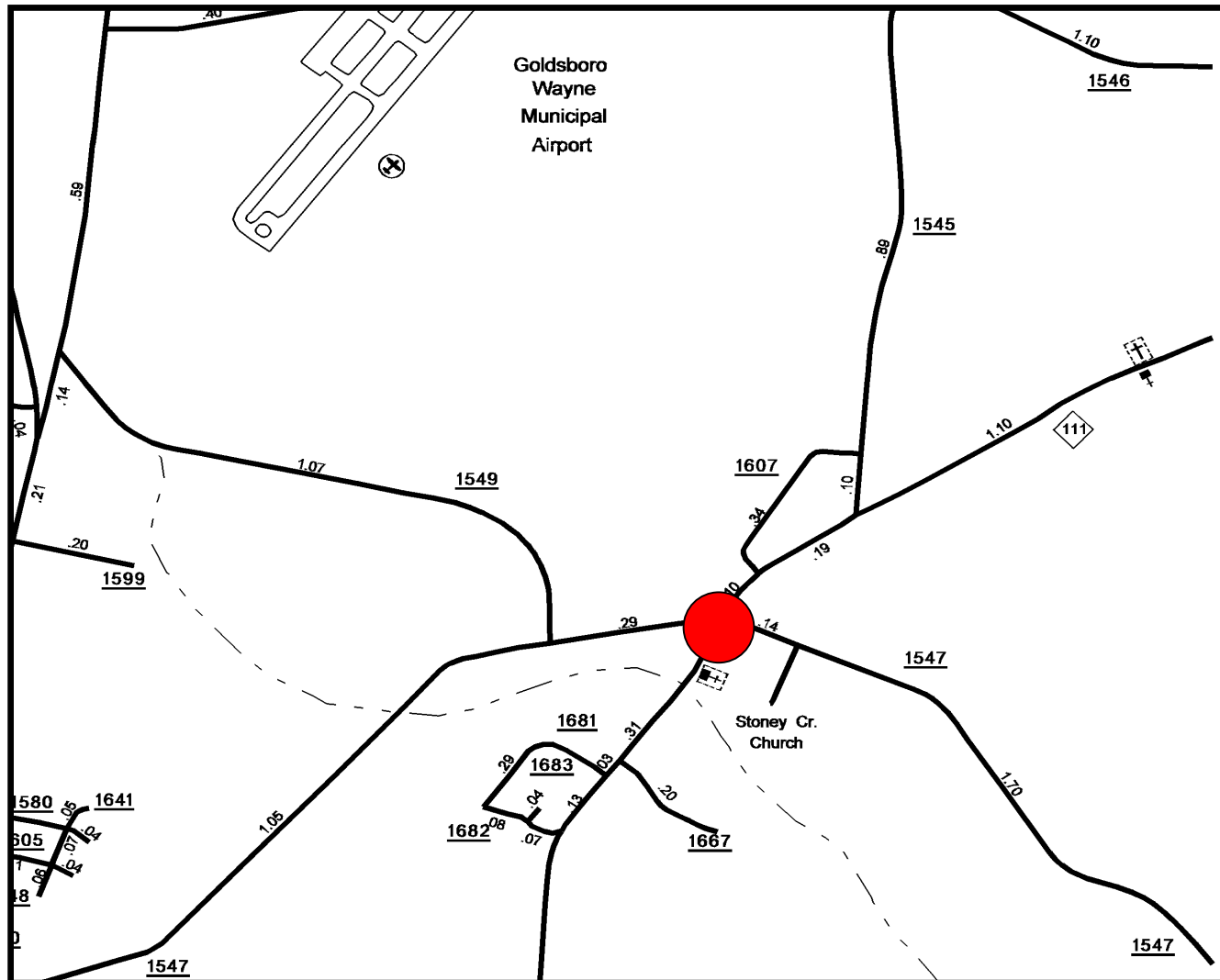
The after period did yield one fatal collision within the study limits. This crash resulted from a driver running off the roadway in the curve north of the intersection, overcorrecting, and colliding with multiple stationary objects, including two gas pumps. Typically, the Safety Evaluation Group would examine the fatal investigation to conclude if suggestive corrective measures were installed but since this fatal did not meet the Target Crash specifications, that action was not conducted.

The calculated benefit to cost ratio for this project is 78.16 considering total crashes. The benefit to cost ratio considering only target crashes is 118.06. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection. One photo is also provided for the shoulder washout concern that is located on the northbound approach, approximately 100 feet south, of the intersection. Upon return from the field investigation on May 30<sup>th</sup>, the Regional Engineer was contacted concerning the potential crash hazard.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

**Location Map**  
**Wayne County**  
**Evaluation of Spot Safety Project # 04-01-217**



**Treatment Location: NC 111 at SR 1547 (Stoney Creek Church Road) near Goldsboro, NC**



**TREATMENT SITE PHOTO TAKEN 5/30/07**



Traveling North on NC 111 (Patetown Rd) – 45 Advisory Speed



Traveling North on NC 111 at Flasher



Traveling East on SR 1547 (Stoney Creek Church Rd)



Traveling South on NC 111 (Patetown Rd)



Traveling West on SR 1547



Shoulder Washout located on NB approach of NC 111

# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 111 at SR 1547  
COUNTY: Wayne  
FILE NO.: SS 04-01-217

BY: JBS  
DATE: 6/19/2007  
NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Overhead Flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$15,000	10	0.149	\$2,235
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$15,000	10	0.149	\$2,235
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$400
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$350
TOTAL ANNUAL COST=	\$2,985
TOTAL COST OF PROJECT=	\$15,000

## COMPREHENSIVE COST REDUCTION:

### ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.50	3	0.67	9	2.00	6	1.33	\$374,533
AFTER	4.50	1	0.22	6	1.33	7	1.56	\$141,178

Annual Benefits from Crash Cost Savings \$233,356

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$230,370

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 78.16

TOTAL COST OF PROJECT - \$15,000 COMPREHENSIVE B/C RATIO - 78.16

# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: NC 111 at SR 1547

BY: JBS

COUNTY: Wayne

DATE: 6/19/2007

FILE NO.: SS 04-01-217

NOTES: Target Crashes

DETAILED COST: TYPE IMPROVEMENT - New Overhead Flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$15,000	10	0.149	\$2,235
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$15,000	10	0.149	\$2,235
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$400
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$350
TOTAL ANNUAL COST=	\$2,985
TOTAL COST OF PROJECT=	\$15,000

## COMPREHENSIVE COST REDUCTION:

### ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.50	3	0.67	9	2.00	2	0.44	\$371,067
AFTER	4.50	0	0.00	4	0.89	3	0.67	\$18,600

Annual Benefits from Crash Cost Savings \$352,467

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$349,481

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 118.06

TOTAL COST OF PROJECT - \$15,000 COMPREHENSIVE B/C RATIO - 118.06

GAS  
STATION

LEGEND			
	MOVING VEHICLE		ANGLE
	PEDESTRIAN		TURNING
	PAKED VEHICLE		BACKING
	FIXED OBJECT		SIDESWIPE
	HEAD ON		OUT OF CONTROL
	REAR END		HIT BY OBJECT
	RAN OFF ROAD		FATALITY
	9 MPH OR LESS		SPEED UNKNOWN
	10 MPH TO 19		
	20 MPH TO 29		
	30 MPH TO 39		
	40 MPH TO 49		
	50 MPH TO 59		
	60 MPH TO 69		
	70 MPH OR MORE		
	P PEDESTRIAN		
	T TRAIN		
	D DRIVER AT FAULT		
	W DRY		
	I icy or SNOWY		
	O ONLY		

SR 1547  
Stoney Creek Church Rd  
55 MPH

SS# 04-01-217  
Wayne County  
Before Period  
9/1/97 - 2/28/02  
NC III at SR 1547

Crash 15: Driver ran off road  
to avoid a vehicle that pulled out of  
westbound SR 1547

NC III  
Patetown Road  
55 MPH

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM

DIVISION 4 AREA

STUDY PERIOD: 9/1/97 TO 2/28/02

DISTANCE: 1-1.16 + 1.50 FT

ANALYSIS PREPARED BY: JBS

ANALYSIS CHECKED BY: BR

DIAGRAM PREPARED BY: JBS

DIAGRAM REVIEWED BY: ST

SCALE: NOT TO SCALE

DATE: 5-23-2007

LOG NUMBER: SS# 04-01-217

N.C. DEPARTMENT of TRANSPORTATION  
DIVISION of HIGHWAYS  
TRAFFIC ENGINEERING AND SAFETY  
SYSTEMS BRANCH

